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JOHN C. HENDERSON
MICHAEL E. TREACY

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Center for Information Systems Research
Massachusetts Institute of Technology
Sloan School of Management
77 Massachusetts Avenue
Cambridge, Massachusetts, 02139

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1.1 Introduction

The CEO of an eastern manufacturing company was frustrated. Before him sat the Vice Presidents of Information Services, Marketing, and Manufacturing. They were embroiled in an emotional debate. "Give us the computer tools my people want!" said the Vice President of Marketing. "If you want productivity improvement from my managers and staff, if you want better decision making, give us what we need--not what some computer expert wants." The Vice President of Manufacturing jumped in: "Why is it that a sixteen-year-old kid can break into a national security computer half way across the country, and our computer people tell us that there is no way to get data from the corporate data center computers to the machines we bought for my group? Your people are just uncooperative because it's not their machine, their software, their recommendation. It doesn't make sense! I might not know a protocol standard from a relational data base, but I do know the business and they don't. And I've been telling you my people need that corporate data."

The Vice President for Information Systems shuddered. They just didn't understand. If they let things get out of control now, they would surely pay for it later. Marketing wanted a minicomputer system that was incompatible with the company's basic system. Manufacturing was already paying the price for buying microcomputers from three different vendors. He

had tried to force Manufacturing to accept his recommendations, but he just ended up feeling further isolated. He looked at the CEO and knew what was coming.

The Director of MIS for a large insurance company was nervous. Two years ago he had acquiesced to the demands of users to bring in micros in a big way. He had thrown open the doors to innovation by establishing an information center to support any and all end user activities. He knew the risks, but what else could he do? Now he was trying to explain why they had to junk all those micros and a lot of the end user developments on their two minicomputers. The more he supported end users, the more demanding they became. First it was access to data, then electronic mail. What hurt even more was his audit report. He had been ripped apart over data security. His best people were swamped with patching poorly written, poorly documented end user programs. There was such a vast array of software and hardware that he couldn't even tell you what was out there, much less provide support for it. And communication was a joke. Even if he could move the data, there were so many vague and conflicting definitions of key financial and business variables that users never knew what they had. Now the company had to bite the bullet and clean it up. He knew what they needed to do, but they were no closer to getting there than they had been two years ago. In fact, they were even farther away. He looked at his report and could easily anticipate the CEO's comments. Before this was over, it was going to cost him more than money.

For information systems managers of today, end user computing represents a clear dilemmma. As illustrated by the senarios above, failure looms ahead for those who follow either of these common paths. Is it an irresolvable conflict grounded in the traditional battle between centralized and decentralized philosophies of management? We think not. Rather, it is the consequence of recent economic and functional improvements in technology. In the remainder of this section, we will identify the underlying issues that have led to this management problem. Section 2 will examine how the relative importance of these issues changes over time. In Section 3, we discuss how these problems are closely related to the absorption of technology by organizations and their movement up a learning curve in end user computing. As such, these conflicts can be managed. But any solution must be firmly grounded in an overall strategy of change management. We argue for an evolving end user computing strategy that adjusts the priorities of goals, organizational structure, and means of control in concert with the changing demands and needs of the organization.

The strategy proposed recognizes four key management issues and maps the change in importance of these issues over time as the organization learns to absorb new technology. It provides for these issues both long term direction and short term management solutions that will both smooth and quicken the transition from the current technological environment to one that will ultimately weave end user computing into the very management fabric of the firm.

1.2 The Issues

The use of computers by non data processing professionals, "end users," is one of the most significant developments in corporate computing in the last decade. It is the leading edge of a major transformation of the nature of managerial work (Zuboff, 1981) and is of growing strategic importance to many corporations (Parsons, 1983; Rockart and Scott Morton, 1983). The challenge for information systems managers is to satisfy the demands of users while evolving end user computing to meet corporate objectives.

This task is made more difficult by phenomenal rate of change. Xerox Corporation estimates that in 1981, 25% of the company's computer resources were dedicated to end user computing. By 1991, this percentage will triple (Benjamin, 1982). Rockart and Flannery (1983) reported that end user computing consumed 40% to 50% of the computing resources in several companies surveyed and that it is growing at rates between 50% to 90% per year. Similar results are reported by Benson (1984).

The rapid growth of end user computing has been accompanied by a set of difficult management issues. For example, should managements invoke standards for hardware to facilitate machine to machine communications or avoid standards so that new and innovative technology can be more easily absorbed? Two distinct end user computing environments are evolving: the mini, or mainframe-based timesharing system, and the microcomputer. Which is appropriate or should the two environments be brought together? There are concerns with the management and security of data. Is this a continuing

role for the information systems department, or will appropriate technology and training allow end users to manage their own data? Many information systems managers are being asked to justify, or at least rationalize, a large and growing investment in end user systems. The analysis is usually impossible to perform.

Many of these issues are familiar to information systems management in another context, but end user computing is unfamiliar and appears to need different solutions than have worked in the past. As well, rapid growth has given an appearance that all these problems need solutions at once.

A starting point for analyzing the management of end user computing is to obtain some clarity on what the fundamental issues really are. Fundamental issues are those that are critical to effective management of the phenomenon and that underlie several apparent problems. By addressing solutions to fundamental problems, a parsimonious set of end user computing policies can be constructed.

There are four fundamental issues that need to be addressed in the management of end user computing. Three of them deal with the infrastructures for hardware, software, data and support services that should be put in place to facilitate the orderly use of information systems by end users. The last issue concerns the evaluation, justification, and planning of end user computing expenditures.

The issue of technological infrastructure includes decisions about the appropriate hardware, software, and communications equipment for the end

user computing environment. In general, the current diversity of equipment in use suggests standards are a major issue for any discussion of end user technology. This diversity makes communications between machines a difficult or expensive technical task and also decreases our ability to standardize on certain packages for end user computing. Each software package has its own command set and unique way of handling data. Thus, it is very difficult for models, analyses, and data developed or used in one type of computer system to be used in another. Software standards promote the ability to share analyses and data and make support and training simpler. But, software standards can prevent users from using the most suitable or desirable software. And standards are difficult to invoke after several packages are in use.

The issue of data infrastructure includes questions about data standards, the need for subject data bases, and security. Rockart and Flannery (1983) report that of the timesharing based end users interviewed, one third of their data is retrieved directly from production systems and one third is keyed in from reports. Quillard et al. (1983) found that less than 10% of the data used by personal computer based end users was obtained directly from production information systems, while half the information was keyed in directly from reports. The difference between these results can be explained partly by the lack of centrally managed and available data for users of personal computers.

The issue of organizational infrastructure concerns support mechanisms, implementation and leadership. Rockart and Flannery (1983) provide a useful

classification of end users into six types: non-programming end users, command level end users, programming level end users, functional support personnel, end user computing support personnel, and data processing programmers. They observed that each type of end user needs different education and support and that much of this is provided by one type of user to another. The diversity of end users and their interdependence creates a difficulty in designing any organizational infrastructure to support end user computing. A centralized information center or other structure for supporting end user computing (Hammond, 1982) may not address the needs of all types of users and may be of only secondary importance to the informal support provided by other users.

Finally, another fundamental issue is the evaluation and justification of end user computing. Evaluation and justification has been a difficult issue for some time. The underlying factors responsible for the recent and rapid growth of end user computing are numerous. Rockart and Flannery (1983) summarized them into four areas: a growing awareness of the opportunity for EUC among managers, dissatisfaction with DP's ability to service information needs, the availability of cheaper and easier to use hardware and software, and business conditions that heighten the need for information. None of the four underlying factors directly relate to adding value to the firm. The growing need for information perhaps comes closest, but this is still some distance from providing an economic rationale for the expenditure of large amounts of money on end user computing. The technology is not cheap and by some estimates costs almost thirty thousand dollars per user. End user computing management is "flying blind" until a tool is

developed to assess the financial and organizational impact of the investment in these systems.

These four issues summarize the most difficult questions at the core of the end user computing dilemma. Successful management in this context depends upon successfully addressing these issues in a timely fashion.

2.1 Criticality of Issues

The vignettes presented in the introduction illustrate the conflicts produced by applying a single management solution to the problems of end user computing. The management framework presented in this paper is based on the observation that the relative importance of the issues identified in Section 1 change over time. As they change, there is a need to vary management strategy over time. Greiner (1972) has observed that organizations rarely evolve smoothly and continuously. Rather, as problem solving approaches and management strategy successfully address a particular set of problems, a new set arises with which current management strategy can not cope. As a result, a discontinuous shift, a revolution, occurs in the evolutionary pattern. The same is true in the evolution of end user computing. But, experience with the absorption of other information systems technologies allows us to predict future issues. Thus, the transition to alternate management policies can be planned.

One powerful model of this evolutionary pattern is provided by research on the diffusion of innovation in organizations and consumer markets

(Majahan, 1979). This research characterizes the difference pattern over time as an S-shaped curve.

An alternate characterization of the same evolutionary patterns of information technology is provided by Gibson and Nolan (1974), McKenney and McFarland (1982), and others. While some have questioned the validity of Nolan's (1979) model as a stage theory its portrayal of a learning curve phenomenon has proved quite useful in practice. McKenney and McFarlan (1982) also note that organizations high on the learning curve for one type of technology must be careful to recognize that a new technology may instigate a new, separate learning curve phenomenon. Quillard et al. (1983) suggest that end user computing is an example of a new technological learning curve that has just been initiated in most organizations. In essence, we argue, a learning curve model approach similar to those discussed above illustrates not only the need for a dynamic management strategy but also allows one to understand how the importance of the four major issues change over time. Each of the following subsections will trace the importance of an issue over time and provide brief justifications for the proposed relationships.[1] Section 3 will then define alternative management strategies that respond to the changing importance of these issues.

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[1]Since the relationships are proposed and not empirically validated, simple linear or piecewise linear functions are used. The authors recognize that the actual importance function may take not mere nonlinear characteristics.

2.2 Support and Education

As shown in Figure 1, during the early phase of learning how to use end user computing technology, the importance of effective organizational support and comprehensive education is a dominating issue. A rich tradition of change management (Kolb and Frohman, 1970; Schein, 1969) and innovation research (Allen, 1977; Tushman and Katz, 1980) provide explicit methodologies for creating a supportive environment. This process-oriented research is quite compatible with the participatory and adaptive design methodologies used by most end users. However, as the organization evolves, the relative importance of specialized organizational and educational support decreases. This results from both successful diffusion of basic skills and methods and from pressures for attention to other issues resulting from rapid, uncontrolled growth. As these other issues grow in magnitude, the relative importance of support and education continue to decline. As shown in Figure 1, support and education of users always remains an issue of some importance. Yet its dominance clearly diminishes over time.

2.3 Technology Infrastructure

The term technology infrastructure refers to the hardware, software, andcommunications technology that make up the end user computing environment. The importance of this technology oriented issue as a management concern varies significantly over time. Figure 1 illustrates

that hardware, software, and communication initially are not an important issue in the management of end user computing. The major impact of microcomputers and advanced user-friendly software is to the change the economics of computing and drop the acquisition cost in personal and finiacial terms below some threshhold. Further, given that most initial end user systems, though functionally sophisticated are relatively simple from a systems perspective, the power or enhanced features of hardware and software are relatively unimportant. Beyond avoiding obviously poor technology, the equipment and software the end user utilizes is much less important than obtaining active involvement and enthusiasm.

As Henderson and Schilling (1984) note, the technical complexity of end user systems usually increases with the passage of time. Further, the rapid growth of the numbers of end users begins to create higher interdependence between users. Requirements for data sharing and transfering programs increase. Thus, an increasing importance of the technology issue through the high growth phase reaches a peak during the control phase.

It is at this control phase where an important event occurs. A primary goal of a well managed maturity phase is the introduction of policies and standards that allow infrastructure alternatives to be evaluated from an economic perspective. (We will discuss this point further in section 3.) As a result, the importance of the technology issue declines. The actions taken during the control phase provide a basis for managing technology as an investment.

2.4 Data Management

Data management refers to the need to make data accessible, reliable, consistent, and secure. This issue has long been recognized by information systems professionals. Yet, during the initial phase of end user computing, data is relatively unimportant. The Quillard et al. (1983) findings suggest that over 80% of the data used by end users are hand entered. Since early applications tend to address specific problems of the end user, problems other than accessibility are minimal. However, as rapid growth sets in, the needs for coordinating the use of data and maintaining reliability, consistency, and security increase. Further, the potential for economies of scale associated with electronically encoding a data element only once become increasingly apparent. The importance of this issue continues to increase through the mature phase.

Ideally, during the mature phase, economic models for evaluating information would be developed. Thus, as in the case of hardware and software, the relative importance of data management could then decrease. However, as shown in Figure 1, the proposed relationship does not decrease, but continues to rise in importance. This trend is based on our current inability to treat information effectively as an economic good with a measurable value. Current theories for the value of information are not sufficiently robust nor pragmatic enough to move the management of data into an economic framework effectively. Thus, the importance of data management continues.

2.5 Evaluation and Justifications

The relative importance of a formal economic mechanism for managing end user computing increases directly with the size of investment over time. In the initial phase, the justification is not an issue. We do not require formal justification from end users. However, as the number of end users grows, the magnitude of organizational investment reaches a level requiring close attention. Ultimately, from a management perspective, the issue of evaluation and justification dominates. That is to say, at the point when an organization has truly absorbed a new technology, it will also have learned to manage that technology within the basic economic framework used to manage other organizational resources.

2.6 Summary

There are two important implications that can be drawn from the dynamic nature of these isses. First, the changing importance of issues requires an evolving management strategy.

Second, the framework provides the means to anticipate future management requirements. Thus, while the issue of hardware and software is initially lower in importance, it constitutes the most critical issue during the control phase. How will management cope with the immediate problems of initiating and expanding the use of this technology, and yet successfully deal with the need for a coherent technological infrastructure? It is this potential ability to manage today's problem while building the capacity to

address the problems of tomorrow that is provided by our view of end user management. The following section defines various management perspectives and illustrates how their properly sequenced implementation not only addresses immediate problems but provides the means to smooth the transition between phases of the learning curve.

3.1 Alternative Management Perspectives

There are at least four basic management perspectives that can be used to contend with the problems of end user computing: Implementation, Marketing, Operations, and Economic. Each perspective inherently places varying weight on each of the issues defined in Section 1. In Section 3.2 we will define each perspective and discuss the implications for organizational strategy, structure, and control. Section 3.3 will illustrate the prefered sequence for implementing these perspectives and will indicate how each satisfies the dominant concerns for the immediate stage of organizational evolution while also enabling management to shift perspectives at the appropriate time.

3.2.1 Implementation

Implementation is defined as organizational innovation achieved through the definition of goals, the design of systems to meet the requirements resulting from these goals, and proper institutionalization of these systems. This definition originates in the work of change management, the

theoretical basis for most information system implementation and organizational development strategies. It is consistent with research on innovation and therefore is a particularly appropriate perspective of an organization's initial use of new technology.

The overall objective is increased usage and user satisfaction (Table 1). The implementation perspective suggests a strategy of participatory management (Keen and Scott Morton, 1978) with a heavy emphasis placed on individual and organizational education. The concept of Decision Support Systems (DSS) emphasized the necessity to consider implementation issues and to manage the development of systems as a change process. The success of DSS provides a clear model for successfully initiating the use of computers by non-technical users. In essence, this strategy attempts to build an enthusiasm for change both through education and by providing effective facilitative roles.

The structural implications for this perspective call for centralized "help" centers and heavy use of roving consultants. Emphasis is placed on consultants rather than computer experts. The facilitating role demands good interpersonal skills with an understanding of the user's business problem. Success is achieved by problem solving, not by providing technical sophistication. Thus, there is a need to provide organizational structure that encourages a demand-pull orientation.

Control mechanisms are minimal and focus on innovators. As indicated by the objective, performance measures are directed at usage and satisfaction,

since measures of benefits are difficult, if not impossible, to obtain at this early stage. Again, the control system emphasizes innovation and rewards effective versus efficient behavior.

3.2.2 Marketing

The marketing perspective views end users as consumers and attempts to influence consumer choice (demand) through effective product design, advertising, and distribution management. The primary objectives are market penetration, often measured by market growth, and market share. The market perspective assumes the consumers (individual end users) are rational and evaluative, but perhaps underinformed. Thus, the strategy must provide for adding value to products and services to differentiate them from the competition, education of consumers about the benefits of these products, and appropriate distribution planning to maximize availability.

Instead of a centralized "help" center, the organization concentrates on understanding needs of the "market" for high payoff, value added products and services, and shaping the demand to fit the available products. Education affects attempts to influence choice as well as transfer skills. The structural implications are to departmentalize or functionalize support services. This perspective provides a transition from the implementation approach. The implementation structure creates organizations that directly affect sales and services, geared to the unique needs of each customer. In essence, they operate a small business. In the marketing perspective, a retail/distributor relationship is formed. Each departmental unit operates

a "local" direct support organization. The central group provides indirect support through these local groups by providing services such as specialized training, enhanced products such as software that allows up loading and down loading of data, and business consulting to the local units. This structure builds upon the efforts of the implementation perspective but extends the capability to understand the market and support distribution through the use of formal local support groups.

Why is the objective of market share critical? Of course, increased market share reflects acheiving the goal of diffusing this technology throughout the organization. But as we will discuss later, a dominant market share also creates a de facto standard. Thus, the need to move to a coherent infrastructure can be effectively addressed by implementing a coherent marketing strategy. For example, successfully marketing a single vendor's integrated technology may be an intelligent approach to move toward coherence. The key to success for this approach is that it can be successfully sold with value added services against competing products.

The control mechanisms focus on holding each department accountable for its expenditures. As in most marketing oriented organizations, the ability to recognize and reward outstanding individual performance in support roles is critical. Control mechanisms should be consistent with this and designed to maximize market share and market penetration.

A second key control relates to the strategy of base building. In the implementation perspective, key individuals, innovators, were the basis of

control. In the market perspective, resources should be directed to ensure a strong market presence; that is, a clear competitive edge that can be the basis for expansion.

3.2.3 Operations

Operations is defined as the ongoing management of equipment, software, personnel and other information technology resources for the purpose of collecting, storing, analyzing, and distributing information. This perspective directly addresses the objective of integrating and rationalizing information technology so as to maximize the efficient use of these resources. The key strategies are to integrate through high level standards and policies and to automate data management and support to achieve efficiencies. Thus, we integrate our communication capability through standard protocols rather than standardizing on hardware or specific application software packages. This standardization strategy translates into a formal information systems planning process for end user computing. Clearly, this perspective will draw heavily on the knowledge and expertise of information systems professionals who have used this perspective in managing other major technology, such as on-line transaction processing systems.

The structure implied by this perspective is a centralized planning and policy organization with a monitoring and advisory role on the operations of major end user projects. This role does not attempt to force specific applications, but ensures that established policies are adapted. Accountability for support services is distributed to the departmental level.

As discussed in the previous section, evaluation and justification and data management also take on more importance in this perspective. Thus, key controls will be centered around traditional cost/benefit analysis requiring a solid business case to justify expenditures and to enforce data standards for a "core" group of corporate related data elements. By the end of this stage, hardware and software policies will permit compatibility tradeoffs to be incorporated into a cost/benefit analysis providing the foundation for the next stage of development.

3.2.4 Economic

The economic perspective treats information as a corporate resource and strives to maximize the organizations's return on investments in information technology. A key element in this perspective is the balance between regulating the "end user" market and permitting a movement toward a free information market. Keen (1981) has suggested traditional data processing was largely based on supply economics, hence efficiency and centralized resource allocation. He argues the new technology has resulted in multiple sources for information technology, small building blocks that can be put together to construct custom systems, and, hence, a move toward demand economics where issues of fast delivery and benefits provided far outweigh cost and efficiency considerations. It would seem clear that, at a minimum, users have far more options to "buy" applications rather than "make" them. This perspective builds upon these trends in an attempt to manage end users using a market, incentive-based approach.

The overall objective of this perspective is to translate investment in information technology into competitive advantage. The key strategy will be to link information systems planning to strategic business planning. An element of this strategic planning process should be to target critical investment areas for regulation. This targeted regulation will extend the base building process and ultimately provide the captial resources necessary to achieve competitive advantage.

The structure for this perspective is similar to operations. However, the monitoring role is relaxed in non-regulated target areas and the emphasis is on self sustaining organization units. These operational units have clear policy direction for the IS strategic planning unit but have wide degrees of freedom to innovate and evolve.

The control structure remains focused on evaluation/justification and data management. However, the incentives introduced by the control mechanism are based on the organization's return on investment. The target regulated areas reflect critical growth or base building effort and receive a close monitoring/advisory control structure.

3.3 Evolving Management Strategy

Each of these perspectives provides particular strengths at different times in the evolution of end user computing. There are other times when each of these perspectives is wholly inadequate. The first information systems executive at the beginning of this article is a case in point. His

is the operational perspective applied to end user computing. He has legitimate concerns about data management and the interconnection of hardware in a network, but has not established enough credibility with or knowledge of user groups to influence their decisions. As well, manufacturing has only recently gained enough experience with computers to appreciate the issues that the IS executive has been unsuccessfully trying to address for more than a year. If he had earlier addressed the users' concerns for support and access to systems, he would today be in a position to influence decisions that address his own concerns.

The IS executive at the insurance company was suffering a different set of problems. He had built his credibility with end users by provding support and education where they thought it was needed. He viewed end user computing from an implementation perspective because he never thought it would be a very important element of his business. That left no one steering the ship and it soon became stranded on a technology reef. The need is to apply each perspective at a time when its strengths match the requirements of the most critical issues. The strategic framework calls for a sequence of perspectives: (1) implementation, (2) marketing, (3) operations, and finally (4) economic. This section discusses why this is the appropriate sequence and how each stage prepares the organization for transition to the next.

The implementation perspective clearly places emphasis on organizational support and education. There is a solid, pragmatic knowledge base suggesting tactics for participatory management, a skill requirement for

internal consultants or change agents, and methods for identifying key innovators (Allen, 1977).

While these management tactics provide the means to initiate the end user evolution effectively, they also provide a very strong foundation for shifting to a marketing perspective. Effective internal consultants learn about their clients' needs. This becomes the basis for value added products and services. A clear, targeted strategy for identifying key innovators and high payoff, low risk initital projects establishes a solid base building effort. Equally important, the educational trust generates an informed "consumer" so one has confidence that rational choice will dominate.

The current use of information centers has often evolved into the framework of an implementation perspective. One common experience among most successful information centers is the rapid growth in demands for their services. That is, they have been effective in supporting the initial phase. The key is to have also retained knowledge of the "market place" so they can begin the transition into a marketing perspective.

The downward economic trend in hardware and software suggests the length of time for the initial phase is decreasing. In fact, organizations may begin this phase spontaneously, moving quickly to a rapid growth phase. The danger in this undirected evolution is the marketplace and base building knowledge required to move effectively to a marketing perspective may be lacking, resulting in a difficult transition.

Organizational support decreases as management pushes responsibility and accountability out to department units. Data management becomes more important as the number of end users increases. This increase creates demands for data sharing, security problems, and accuracy/integrity problems. Feasible service strategies require limiting the range of hardware and software. This limiting should be done by creating value added products; for example, supporting communication to the host for a certain set of personal computers. Rather than dictating standards at this point, the same objective can be met by aggressively marketing to the organization particular packages of hardware and software. Traditionally, this is the means by which standards and technologies have been established. The key is to translate knowledge about users acquired during the implementation phase into value added packages and to establish a presence through base building.

Again, these activities provide the crucial foundation to make the next transition. As discussed earlier, a key strategy in the upcoming operation perspective is standardization. Through a value added approach, management introduces the priorities and standards, and lets the consumer, the end user, choose the first phase of standards. As the benefits of increased communication and functionality appear, the business case for corporate policy is being established.

As the organization moves into the control stage, the proactive standardizing and formal planning activities increase. The information system professional plays a key role in this stage as he or she brings to bear technical expertise concerning standards. This technical perspective

is combined with the knowledge of the market gained in the previous stage to create effective standards. The more formal planning process can cope with traditional issues such as capacity, security, space, and data integrity. This process also allows increased emphasis on justification in a manner analogous to well established business and investment planning processes. This stage accomplishes two goals vital to effective transition into the next stage. First, through the standards process alternative information technologies can be viewed as an economic good. That is, a variety of equipment can be obtained so long as it meets reasonable corporate standards such as compatability with communication protocols. Thus, market pressures begin to insure appropriate pricing.

Second, the organization learns how to fold end user computing into a formal planning process. Appropriate terminology, assumptions and benchmarks are established. The difficulty of this exercise is probably related to the sophistication of the existing strategic information system planning process.

Thus, the stage is set for transition into the final phase of evolution. The capability to link the strategic business plan with an existing strategic end user computing plan is established. The notion of targeted regulation results since projects directed toward competitive advantage many require specialized service or resource commitment. End user organization has fully absorbed the technology and now can manage both the technology and the human resource issues that accompany this technology. Thus in this stage, the organization seeks to convert this management knowledge into an ever incresing competitive position.

4.0 Conclusion

Three general conclusions can be made upon viewing this framework. First, if the assumption that the criticality of information issues is dynamic in nature is accepted, the framework offers a comprehensive management plan for coping with this dynamic process. Management takes actions as early as the initiation stages that is directed toward smooth transition into control and ultimately into a mature stage. In essence, it provides a pragmatic road map for the organization through this learning process.

Second, we postulate skipping a phase will increase organizational conflict and reduce effectiveness and productivity. The operations perspective is the one most often embraced by current information management. There is a tendency to impose this perspective on the organization too early. The result is the IS manager loses credibility and is ultimately bypassed. One consequence of this is his or her experience and advice, critical at the control stage, may be missing. Further, key decision shaping standards in early stages may be made without effective consultation with the IS professional. This framework suggests a macrostrategy that permits organizational growth, yet maintains the important role of the information systems professional.

Third, the framework suggest important researcher issues for the future. Given the view that end user computing represents an organizational thrust in DSS, the current inability to evaluate the impact of DSS or to

justify DSS efforts will limit the organization's usage of this technology. As indicated in the framework, evaluation and justification take on increasing importance over time. The research community must repond to this trend by providing the means to carry out evaluation and justification.

Finally, the inability to reduce the relative importance of data management during the last stage is significant. We do not have the theoretical means to treat data as an economic resource; thus, we are limited in our ability to manage information from an economic perspective. The research issue is to determine the policy set that allows a pragmatic value of information measure and, thus, provides the key building block for the economic management perspective.

Figure 1

Criticality of Issues over Time

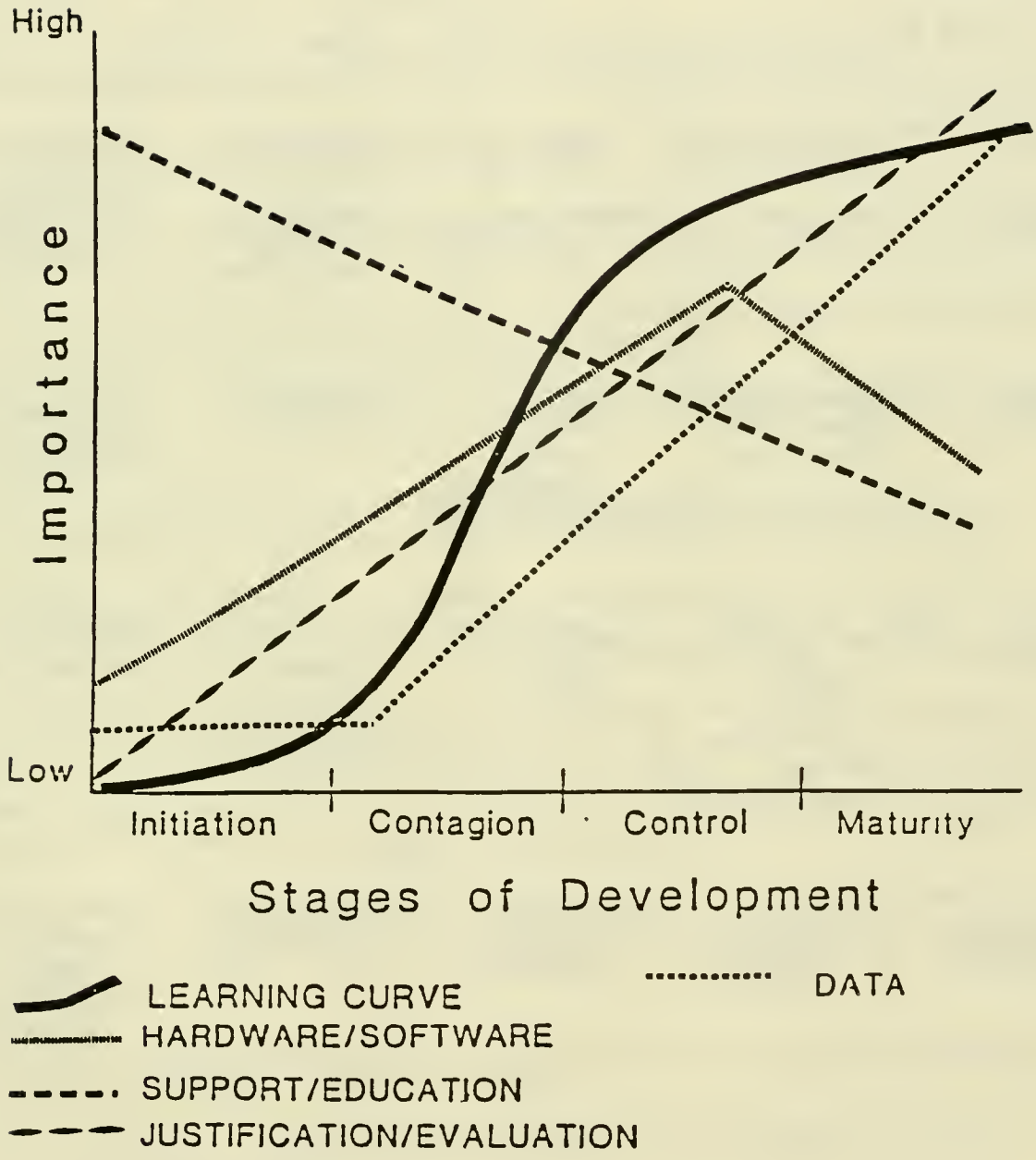

Table 1

Different Perspectives for Managing End User Computing

	IMPLEMENTATION	MARKETING	OPERATIONS	ECONOMIC
Objective:	Usage and satisfaction	Growth and penetration	Integration and efficiency	Competitive advantage
Strategy:	Opportunistic Supportive Educational	Value added products & services Base building	Standards Automation	Link IS plan to strategy Targeted investment
Structure:	Centralized general help facility Roving consultants	Departmental support expert	Centralized formal planning Decentralized support	Distributed operations
Control Mechanisms:	Minimal through innovators	Departmental accountability	Centralized policies	Formal justification Organizational incentives

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